

ing themselves into their new sphere of being. As the sunlight falls upon the *cilia* they are tinted with a most lovely violet colour.

The gemmule is circular in form, white, opaque, and bears a striking resemblance to a *low-crowned hat*. The margin is fringed with *cilia*. There is an orifice beneath opening on the edge of the disc, about which there are *cilia*, which play down into it.

Occasionally a cup-shaped organ is protruded near this aperture on which I have frequently observed a mass of fæcal matter.

There is great difficulty in examining these beings with the microscope, but I have been able to determine the above points with tolerable certainty.

The number of gemmules produced is immense. On a small specimen, incrusting both sides of a piece of weed, which did not exceed an inch and a quarter in length, and half an inch in breadth at the widest part, about 120 ovaries were reckoned. Each of these would contain about nine ova, so that more than a thousand altogether would be liberated from this inconsiderable fragment.

EXPLANATION OF PLATE XIV.

Fig. 1. The gemmule of *Flustra hispida*.

— 2. The same, as it appears shortly after having become attached.

— 3. A cluster of the cells of *F. hispida* in various stages of development.

— 4. Cell and polype recently developed from the gemmule.

— 5. *Mimosella gracilis* of the natural size—the cells folded together on the pinnae.

— 6. A portion of a pinna magnified, showing the cells expanded.

— 7. A single cell, with the circular orifice near the base.

— 8. A cell just separated from the pinna.

— 9. *Pedicellina gracilis* of Sars.

— 10. *Furcella producta*.

XXIX.—A List of all the Mosses and Hepaticæ hitherto observed in Sussex. By WILLIAM MITTEN, A.L.S.

[Continued from p. 324.]

Tribe IV. FUNARIACEÆ.

Genus 1. *Ephemerum*, Hampe.

118. *E. serratum* (Schreb.), Hampe.

Phascum serratum, Schreb. Eng. Fl.

Frequent in autumn and early spring.

119. *E. cohærens* (Hedw.), Hampe; “dioicum; basi filis prothalli instructum, subacaule; folia ovali-lanceolata serrata,

nervo evanescente [raro excurrenti] acuminata; theca globoso-ovalis recto-apiculata obtusa immersa superne brunneo-purpurea; calyptra tenerrima basi lacerata longi-apiculata."—C. Müller, *Synops.* p. 32; *Bryol. Europ.* fasc. 42. *Ephemerum*, t. 1.

On the exposed mud of the large pond at Pondleigh near Hurstpierpoint; more plentiful some seasons than others, according as the pond is more or less dried up; large quantities often remaining in the conservoid state without developing leaves or capsules.

Closely resembling *E. serratum* in size and habit, but readily distinguished under the microscope by its nerved leaves, which are also rather wider. The nerve is very variable, being sometimes prominent, at others requiring a transverse section to be made of the leaf before it is visible, and sometimes it appears more strongly defined in the upper part of the leaf than in the lower.

In the second review of the species of this genus in 'Bryologia Europæa,' *Ephemerum cohærens* is stated to be found in "Anglia occidentali," but it is not known to have been gathered in any other locality besides the one above given.

120. *E. sessile* (B. et S.), C. Müller; *Bryol. Europ.* fasc. 42. t. 2.

Phascum crassinervium, *Bryol. Europ.*

P. stenophyllum, Voit. *Wils. in Eng. Bot. Suppt.* t. 2829.

In small quantity on Henfield Common, and by the large pond at Pondleigh.

Genus 2. *Ephemerella*, C. Müller.

121. *E. pachycarpa* (Schw.), C. Müller.

Phascum crassinervium, *Wils. in Eng. Bot. Suppl.* t. 2932.

Frequent in stubbles.

Genus 3. *Physcomitrium*, Brid.

122. *P. patens* (Hedw.), Mitten.

Ephemerum patens, Hampe, C. Müller.

Physcomitrella patens, B. et S. *Bryol. Europ.* fasc. 42.

Phascum patens, Hedw. *Eng. Fl.*

Common on clayey soils in autumn.

123. *P. pyriforme* (Linn.), Brid.

Gymnostomum pyriforme, Hedw. *Eng. Fl.*

Frequent on moist ditch-banks.

Genus 4. *Entosthodon*, Schw.

124. *E. fasciculare* (Hedw.), C. Müller.

Physcomitrium fasciculare, *Bryol. Europ.* *Physcomitrium*, p. 13. t. 4.

Rare: it has been gathered at Hurstpierpoint, Henfield, Albourne, and Kingston near Lewes.

125. *E. ericetorum* (Bals. et De Not.), C. Müller.

Gymnostomum fasciculare, Eng. Fl.

Common on moist sandy banks, particularly in the forests.

Genus 5. *Funaria*, Schreb.

126. *F. hygrometrica*, Linn.

Frequent.

127. *F. Muhlenbergii*, Schw.

Rare: road-side bank by Offington, near Broadwater, Mr. Borrer. On the Downs near Stanmer, at Findon, and at Littlehampton, Mr. Jenner.

Genus 6. *Splachnum*, Linn.

128. *S. ampullaceum*, Linn.

On bogs on Ashdown Forest, Messrs. Woods, Jenner, and Reeves.

Tribe V. BRYACEÆ.

Genus 1. *Schistostega*, Mohr.

129. *S. osmundacea*, Web. et Mohr.

S. pennata, Hook. and Taylor, Eng. Fl.

Very rare: in some holes in a bank at Bolney; barren.

Genus 2. *Orthodontium*, Schw.

130. *O. gracile* (Wils.), Schw.

Eridge Rocks, Mr. Borrer; High Rocks, Mr. Reeves; and Mr. Jenner has gathered it elsewhere in the neighbourhood of Tunbridge Wells.

Genus 3. *Bryum*, Dill. emend.

Section 1. Inflorescence dioicous.

131. *B. roseum*, Schreb.

“Frequent about Tunbridge Wells,” Mr. Jenner, but not generally a common moss. It exists in small quantity at Hurstpierpoint and Henfield, and scattered plants may be found on the Downs often mixed up with *Dicranum scoparium* and *Leptotrichum flexicaule*: it is always sterile.

132. *B. Billardieri*, Schw. Suppt. t. 76; “dioicum; laxe cæspitosum veluti prolifero-ramosum; folia inferiora remota, superiora in rosulam densam siccitate gemmiformem congesta, erecto-patentia haud tortilia rigida, ovato-acuminata lata, margine revoluta, apice dentata, nervo in mucronem rigidiusculum producto, intense viridia concava, e cellulis densis firmis statu emolliendi mollioribus composita; theca obconico-pyriformis in pedunculo superne arcuato pendula fusca, operculo convexo breviter apicu-

lato pulcherrime aurantiaco vel purpureo nitido.”—C. Müller, *Synops.* p. 253 [sub *B. canariense*].

B. Billardieri, Bryol. Europ. Bryum, t. 46.

B. canariense, Schw. Suppt. t. 204.

B. campylothecium, Tayl. Lond. Journ. Bot. 1846, p. 52.

On Woolsonbury Hill near Hurstpierpoint: very rare and sterile.

Stems in the specimens from the above locality about half an inch high, loosely cæspitose; leaves collected together at the tops of the stems, bright green, erecto-patent, ovate and ovate-acuminate, without a thickened margin, towards the apex dentate, the nerve excurrent, and above the apex of the leaf bent slightly backwards.

After a comparison of the specimens from Woolsonbury Hill with others from the Canaries, the Cape of Good Hope, New Zealand, Australia, and the Falkland Islands, it appears that there is no essential difference between *B. Billardieri*, *B. canariense*, and *B. campylothecium*. In the forms named *B. Billardieri* and *B. campylothecium*, the leaves are wider above than in the form named *B. canariense*; but the size and form of the cells, the reflexed lower margins, and denticulate apices are precisely the same in both. Schwaegrichen has figured and described the internal peristome of *B. canariense* with short and imperfect cilia, which might arise from immature specimens having been examined.

The *B. campylothecium* of Taylor, collected by Mr. J. Drummond at Swan River, differs from the usual forms of *B. Billardieri* only in having more boat-shaped leaves, and in this respect is analogous to similar forms of *B. capillare*.

Very similar as many species of *Bryum* are in a barren state to the unpractised eye, *B. Billardieri* however presents at once a character by which it may be readily known, in the denticulate apices of the leaves.

No dependence ought to be placed on the relative width of the margin as a distinctive character in species of this genus, for in some species, as *B. capillare*, it may be observed to vary from one that is almost imperceptible to one that almost equals that present in some *Mnia*.

133. *B. Donianum*, Greville, Transact. of the Linnæan Soc. xv. ii. p. 345. t. 3. f. 6; “habitus *B. capillaris*; folia caulina oblongo-ovata lata acuminata viridissima, margine crasse et flavo limbata remote denticulata, nervo crasso flavo excedente crasso-mucronata; perichætialia interna multo angustiora minora margine valde revoluta; theca in pedunculo longiusculo purpurascens apice arcuata elongato-cylindrica ore coarctata fusca, operculo conico acuto concolori nitido.”—C. Müller, *Synops.* p. 282. sub nom. *B. platylomatis*, Schw.

B. platyloma, B. et S. Bryol. Europ. Bryum, t. 26.

B. Mülleri, Spruce in Musc. Pyren. No. 138.

Frequent on hedge-banks in sandy soils. The fruit was first gathered

by Mr. Jenner by the roadside between Icklesham and Winchelsea, where it is very plentiful ; it has also been met with in small quantity in several places about Hurstpierpoint.

[The plant in a barren state has been gathered at Reigate and Betchworth in Surrey by Mr. Borrer, and by Mr. Wilson near Warrington.]

In size and mode of growth this species closely resembles some of the larger forms of *B. capillare* found on moist sandy banks. The stems are seldom more than half an inch in height, densely covered below with brown radicles ; the leaves are erecto-patent, not twisted nor spreading, oblong-ovate, and not so much inclining to a spatulate figure as those of *B. capillare* ; the nerve is stout, and does not run into a hair-like point, but forms a stiff mucro at the apex of the leaf ; the margin is thickened and towards the apex denticulate ; the capsules are cylindrical, of a brown-red colour when mature, the operculum conical, acute, and shining.

Dr. Greville has given an excellent figure of this species in the place above quoted, and through his kindness the original specimens from the Ionian Islands have been compared with the Sussex moss.

B. Donianum may always be known by its erecto-patent, thickly margined, stoutly nerved leaves, with a short and rigid mucro.

134. *B. pseudo-triquetrum*, Hedw.

B. ventricosum, Dicks.

Frequent in bogs and wet places.

135. *B. alpinum*, Linn.

In small quantity on Henfield Common, and by the margin of Tilgate Pond in Tilgate Forest : sterile.

136. *B. pallens*, Sw.

B. turbinatum, Eng. Fl.

Common ; but rare in fruit.

On the forest between Balcombe and Handcross a slender form of this species has been gathered with an imperfect internal peristome, the cilia being rudimentary and destitute of appendages ; in other respects it corresponds with the usual state.

137. *B. capillare*, Hedw.

Abundant on roofs, walls, rocks, trees, and on the ground.

This common species offers a good subject in which to observe by analogy the variations to which allied species are subject. The margin of the leaves is liable to the greatest variation ; and in those states in which it is most evident, it is always more prominent and thickened in the perichætical leaves.

The authors of the 'Bryologia Europæa' have taken as their typical form that in which the nerve of the leaf ceases just below the apex, and the hair-like point is composed of the united margins. This form is common on shaded banks and in woods. C: Müller, in his Synopsis, describes as the normal state that with an excurrent

nerve; and as this is by far the most usual state, it has the greatest right to be considered the most perfectly developed form of the species.

Var. *rosulatum*.

B. rosulatum, Mitten MSS.

Cæspitosum, humile, inferne tomentosum: folia ut plurimum in capitulis rosulatis congesta, ovalia vel spathulata, acuminata, acuta vel obtusata, integerrima, nervo infra vel paulo ultra medium evanescente apice sæpe torto et recurvo.

In very small quantity and sterile on Woolsonbury Hill.

Different as this moss appears at first sight from all other species of *Bryum*, it too nearly resembles some states of *B. capillare* to admit of its being considered distinct: the leaves are very variable in size, in form, and in the length of the nerve, as well as in the acumination or obtuseness of the apex; the same rosulate head producing some leaves that are elliptic, sometimes acute or sometimes obtuse, or spathulate with the apex twisted about half-way round, and obtuse, acute, or even sometimes bidentate. The nerve is sometimes very short, at others it extends to a little beyond the middle. The texture is similar to that of *B. capillare*, but it differs from all the common forms of the species in wanting the piliform acuminate point. The margin, if margin it may be called, consists only of a single row of narrower cells.

138. *B. cæspiticium*, Linn.

On walls and banks, but not very common.

139. *B. erythrocarpum*, Schw.

At Henfield and Hurstpierpoint in small quantity; not rare on the forests.

140. *B. atropurpureum*, Wahlenb.

Frequent on the earth in waste places and on walls.

141. *B. argenteum*, Linn.

Common on the ground, on walls and roofs. On a wet sand-bank near Hurstpierpoint, a state with pale yellow setæ and capsules occurs, but not otherwise different.

142. *B. albicans*, Wahlenb.

In the neighbourhood of Hurstpierpoint and Henfield; not unfrequent nor confined to any particular soil, but always barren.

143. *B. annotinum*, Hedw.

In fruit at Balcombe and Tunbridge Wells: plants without fruit are not uncommon.

144. *B. carneum*, Linn.

Frequent on wet ditch-banks.

145. *B. Tozeri*, Greville.

Not uncommon about Hurstpierpoint and Henfield, where it fruits occasionally in small quantity.

146. *B. crudum*, Schreb.

Gathered near Tunbridge Wells by Mr. Jenner ; sterile. [Mr. Borrer has gathered this species in fruit at Betchworth in Surrey.]

Sect. 2. Inflorescence monoicous.

147. *B. nutans*, Schreb.

Widely distributed, but seldom fruiting.

Sect. 3. Inflorescence hermaphrodite.

148. *B. cernuum*, B. et S.

Common on walls and roofs, and on the ground.

A form with separate male flowers, but not presenting any further difference, is sometimes found ; the fertile flowers are all hermaphrodite.

149. *B. inclinatum*, B. et S.

Frequent in sandy places, by roadsides and on walls. In moist sandy places the setæ are often much elongated.

150. *B. intermedium*, Brid.

Plentiful on wet sandy banks near Hurstpierpoint, at Hastings, and near Battle.

This species fruits chiefly in summer ; but it is at all seasons more or less in fruit, which may be owing to the successive development and maturity of the antheridia, as observed in 'Bryologia Europæa.'

151. *B. bimum*, Schreb.

B. ventricosum, Eng. Fl. in part.

On the bog on Henfield Common. Mr. Borrer has gathered it at Amberley, and Mr. Jenner at Slindon.

152. *B. torquescens*, B. et S.

Under beech-trees on Woolsonbury and Newtimber Hills ; on a stone wall at Henley Hill, and in the same situation near the Hungershall Rocks at Tunbridge Wells, where it has also been gathered by Mr. Jenner. [Mr. Borrer has gathered it on a wall at Hurtmoor near Godalming in Surrey.]

The state of this moss which has been gathered in the above localities corresponds with specimens received from M. Schimper, and is much larger than the slender form gathered at Gormire, Yorkshire, by Mr. Borrer, and described by Mr. Spruce.

So great a resemblance has this species to *B. capillare*, that, without examination, it might be readily passed over for that moss ; but the capsules are more pendulous, and the seta is curved with a wider arc, so that the capsule hangs about its own length distant from the

parallel seta : this peculiarity will often distinguish *B. torquescens* from *B. capillare* at first sight.

153. *B. pyriforme*, Hedw.

In the stone-pit at Henfield, and about Tunbridge Wells.

In his 'Synopsis,' p. 330, C. Müller says of this species : " Peristomii interni dentes maxime sulcati et hiantes valde serrati igitur veluti (sed non) appendiculati hyalini, ciliis solitariis brevibus non appendiculatis hyalinis interpositis. Formam peristomii hanc in speciminibus permultis examinatis invenimus et 'Bryol. Europ.' indolem non vidimus." The appearance above described is not the primary state of the peristome, which is correctly figured in 'Bryol. Europ.,' but is produced by the splitting of the processes down the carina as in *Acidodontium* and *Bartramia*, each half of the process bending over the intermediate cilia to meet at the apex the half of the next process : thus the two intermediate cilia with the two halves of the processes overlapping them, closely resemble a simple process, and the appendiculæ of the cilia sticking out here and there make it appear to be appendiculate.

Tribe VI. BARTRAMIACEÆ.

Genus 1. *Bartramia*, Hedw.

154. *B. fontana* (L.), Schw.

Common in bogs and wet places ; rarely fertile.

155. *B. pumila*, Mitten ; dioica ; dense cæspitosa tomentosa parum ramosa ; folia caulina erecto-patentia homomalla ovato-lanceolata, nervo crasso superne dorso apiceque denticulato excurrente cuspidata, opaca, margine denticulato recurvo, e cellulis parvis ut plurimum rectangularibus viridibus densiusculis, papillis remotis scabridis instructis, areolata ; perigonia interna e basi lata concava patentia obtusiuscula minute denticulata, nervo crasso sub apice evanido : perichætialia longiora latiora et parum acuminata : theca in pedunculo elongato rigido undulato erecto subito inclinata globosa sulcata, operculo plano-conico obtuso ; peristomium duplex normale.

In a wet place near Tilgate Pond, Tilgate Forest ; the male plant only. Mr. Wilson has sent the barren female plant gathered by Mr. Croall in the Carse of Arderseir, Inverness-shire. The fruit is described from specimens gathered near Dollar, Perthshire, by Mr. M'Ivor.

The stems of this species in size and habit closely resemble those of *B. marchica*, and some small states of *B. fontana*. The figure of *B. uncinata*, Schwaegrichen, Suppt. t. 57 [*B. scabrida*], excepting the capsule and uncinata narrower leaves, very well represents *B. pumila* ; but in this, as in *B. marchica*, the perigonial leaves are acuminate and acute, whilst those of *B. pumila* are obtuse like those of *B. fontana* ; again, the cauline leaves of *B. pumila* are perfectly ovate-lanceolate,

and not acuminate, nor so wide at the base as those of *B. fontana*. The fertile plants from Mr. M'Ivor are very different in appearance, being very much smaller; yet they appear to belong to the same species.

It seems impossible in the absence of authentic specimens to ascertain if this be the *B. fontana* β . *pumila*, "caule abbreviato simpliciusculo; foliis lanceolatis," of Turner, Musc. Hibern. p. 107. t. 10. f. 1. The only part of his description that points to *B. pumila* is "foliis intensius viridibus, nec acuminatis, nec cuspidatis," besides the observations that it is much more slender and shorter than α . The figure does not at all resemble the fertile *B. pumila* from Dollar, and that of the leaf represents it as described, "multo luculentius serratis;" from which it is just possible that the plant intended by Turner may be *B. rigida*, which has been gathered in Ireland.

156. *B. pomiformis*, Hedw.

On sandy banks: not very common.

Tribe VII. MNIACEÆ.

Genus 1. *Fissidens*, Hedw.

157. *F. taxifolius* (Linn.), Hedw.

Very common.

Stems of this species may sometimes be found with the seta arising from just below the top.

[To be continued.]

XXX.—On the Branchial Currents in Pholas and Mya.

By JOSHUA ALDER and ALBANY HANCOCK.

[With a Plate.]

THE existence of branchial currents in the Bivalve Mollusca, produced by the action of cilia, and admitted and discharged by different apertures, though denied by one or two authors, may be considered sufficiently established to allow of little further discussion. But though most naturalists admit the existence and action of these currents as a general law, yet exceptions have been claimed for some families and genera, whose anatomical structure is supposed to present an insuperable obstacle to the existence of inhalant and exhalant currents by different siphons; these siphons, as it is thought, having no communication internally. Among the families so placed are the *Myadæ* and *Pholadidæ*.

Mr. Garner in his excellent essay on the Anatomy of the *Lamellibranchiata*, published in the 'Transactions of the Zoolo-